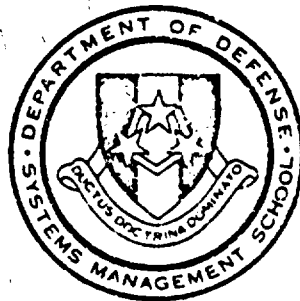


DEFENSE SYSTEMS²_{B-5} MANAGEMENT SCHOOL



PROGRAM MANAGEMENT COURSE INDIVIDUAL STUDY PROGRAM

INDEPENDENT RESEARCH AND DEVELOPMENT--
ISSUES AND ALTERNATIVES

STUDY PROJECT REPORT
PMC 76-1

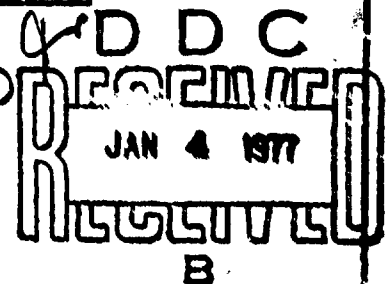
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408462 *James*

STUDY TITLE:

INDEPENDENT RESEARCH AND DEVELOPMENT--ISSUES AND ALTERNATIVES

STUDY PROJECT GOALS:

To review the present IR&D policy and to identify, define and evaluate the current issues and proposed alternative approaches to the DOD IR&D program.

STUDY REPORT ABSTRACT:

The purpose of preparing a report on IR&D issues and alternatives was two-fold:

cont fr p ii
This report seeks:

1. To determine what was perceived as the value of the DOD IR&D program; and,
2. With some knowledge of the current administrative policy for IR&D, to determine the proposed alternatives and how they are perceived. As an industry representative in the Program Management Course, this study provided insight into possible future trends and potential effects on contractors' independent R&D effort.

The study was conducted primarily through research of Congressional testimony; statements from Government representatives including DDR&E, GAO and OMB; and industry position papers. Two interviews were conducted which helped to identify the principals in the IR&D controversy and the important recent documents on the subject.

This
The study report includes: the discussion centering around the benefits of IR&D; definition of various proposed alternative recovery methods for IR&D costs; and the evaluation of these methods by the parties involved in this controversial program. *(a)*

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Key Words: IR&D

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May 16, 1976

INDEPENDENT RESEARCH AND DEVELOPMENT--
ISSUES AND ALTERNATIVES

Study Project Report
Individual Study Program

Defense Systems Management School
Program Management Course
Class 76-1

by

Michael F. Salata

May 1976

Study Project Advisor

David D. Acker

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EXECUTIVE SUMMARY

Independent research and development (IR&D) is contractor technical effort not sponsored by or required in the performance of a Government contract. Department of Defense

DoD Directive 5100.66, in compliance with the Armed Services Procurement Regulations and Section 203 of Public Law 91-441, states the policy for recovery of contractors' costs and outlines the procedures for administration of contractor-initiated ^{R/D} research and development effort.

Controversy over the DOD policy is centered around two main points: (1) The value of IR&D to the Government, considering the expenditure involved; and (2) the appropriateness of the present method of recovery of costs considering other possible alternatives. DOD and industry mutually agree that IR&D fosters competition and independence while contributing to the technology base of the Nation and the stability of the Defense industry.

In 1973 Congress requested an in-depth investigation of the IR&D program by the Government Accounting Office. This request in turn brought out comment from Government agencies and industry organizations. The GAO report in June 1975 endorsed the IR&D program but could not specifically determine whether the benefits of IR&D were worth the cost. Other opinions on benefit to the Government were received during

Senate hearings in September 1975. A unanimous opinion was not obtained and recommendations ranged from elimination of IR&D to reduction in constraints under the current policy.

The GAO also reviewed 14 alternatives to the present reimbursement method. In doing so, comments were solicited from knowledgeable parties. The Council of Defense and Space Industry Association (CODSIA) provided industry's view of advantages and disadvantages of each. CODSIA concluded that a system without constraints except for reasonableness and allocability is best. Sufficient rationale has not been generated to make it obvious that any major modification to the present IR&D policy is desirable.

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SECTION I

INTRODUCTION

Independent research and development (IR&D) is contractor technical effort which is not sponsored by or required in performance of a government contract or grant. It includes basic and applied research, development, and systems and other concept formulation studies.

Contractor's initiate and direct IR&D programs under policy established by the Department of Defense and other government agencies. The IR&D technical effort is of mutual benefit to both the contractor and the government. The contractor's primary benefit is the achievement of a competitive position in a technological area. From the government's standpoint, IR&D supports DOD's responsibilities which include assuring maintenance of quality and level defense-related technology to insure national security for the future and efficiently acquiring the needed defense systems capability at minimum overall cost to the government.

Regarding DOD policy, contractors' IR&D costs have been recognized in some form since 1940. (Ref. 4, p. 4) Policy has evolved, but so has concern from some government circles for the value received from this policy and for the administrative practices employed in carrying out the policy.

The purpose of this report is to recognize the current major issue of cost versus benefit and the alternatives to

DOD's independent research and development policy and administration. Although there has been active concern over IR&D practices in the past, IR&D is more controversial now than ever before. In recognizing the major areas of controversy, this report will review the positions taken by Congress, the Department of Defense, other involved government agencies, and industry.

Section II contains a review of the current IR&D policy. The issues and responses related to the value or benefits of IR&D are discussed in Section III. Section IV describes alternatives to the present method of conducting an IR&D program. This report concludes with a summary in Section V.

SECTION II

IR&D POLICY

Department of Defense Directive 5100.66 (Ref. 1) states the DOD policy for the recovery of the costs of contractors' IR&D programs and outlines procedures for administration of contractor IR&D programs in compliance with the Armed Services Procurement Regulation (Ref. 2) and Section 203 of Public Law 91-441. (Ref. 3) The directive indicates DOD recognition of IR&D as a necessary cost of doing business, particularly in a high technology environment.

In compliance with the Armed Services Procurement Regulation (ASPR), DOD seeks to:

1. Assure the creation of an environment which encourages development of innovative concepts for Defense systems and equipment which complement and broaden the spectrum of concepts developed internally to DOD.
2. Develop technical competence in two or more contractors who can then respond competitively to any one requirement DOD seeks from industry.
3. Contribute as appropriate to the economic stabilization of its contractors by allowing each contractor the technical latitude to develop a broad base of technical products.

2.1 Management of IR&D

DOD Directive 5100.66 establishes the framework for the management of the IR&D program. A DOD IR&D Policy Council has been formed to provide DOD policy and guidance essential to efficient administration of IR&D activities. This includes

determination of the level of support required of DOD, IR&D goals, assurance of valid potential military relevancy of contractors' efforts, negotiation policies, and response to Congressional inquiries.

The Policy Council members include the Deputy Director of Defense Research and Engineering (DDR&E) (Chairman), Assistant Secretaries of Defense for Comptroller and Installations and Logistics (I&L) and the Assistant Secretaries for R&D and I&L for each military service.

2.1.1 Technical Evaluations

The DOD Directive requires yearly evaluation of contractor submitted technical plans to evaluate the technical quality of the contractors' IR&D program and to determine the potential relationship of projects to a military function or operation. Additionally, on-site reviews are to be conducted with each contractor at least once every three years.

An IR&D Technical Evaluation Group (TEG) was formed to establish criteria, methodology, and quality ratings of contractor IR&D programs. DDR&E appoints the chairman of the TEG who, with a designee from each military Department (IR&D Managers) constitute the Group. The TEG designates the lead Military Department for each contractor, establishes technical plan formats and schedules, and otherwise provides guidance and procedures such as to the Defense Contract Administration Services for negotiations of advance IR&D

agreements.

The IR&D Managers designate Military Department organizations responsible for contractor evaluations and are responsible for the on-site reviews.

2.1.2 IR&D Data Bank

The IR&D Data Bank is a centralized computer-based information source at the Defense Documentation Center. It contains data on each IR&D project described in each contractor's technical plan. The Data Bank is used by the DOD components in coordinating contract R&D and Military R&D programs.

2.2 Allowability of IR&D Costs

Allowable IR&D costs include all direct costs and all allocable indirect costs except general and administrative (G&A) costs. Direct and indirect costs are determined on the same basis as if the IR&D project were under contract. IR&D costs are recoverable by contractors as indirect costs on generally the same basis as general and administrative expenses. When the G&A base does not provide equitable cost allocation, the contracting officer may approve use of a different base by advance agreement.

Any contractor which received payments in excess of \$2 million from the DOD for IR&D and bid and proposal (B&P) is required to negotiate an advance agreement which establishes a ceiling for allowability of IR&D costs for

the forthcoming contractor's fiscal year. Advance agreements may be negotiated with contractor profit centers (which contract directly with the DOD) which recover more than \$250 thousand in IR&D and bid and proposal (B&P). For companies incurring less than \$2 million, recovery formulas are established based on IR&D costs to total sales or other acceptable base.

Contractors which meet the \$2 million threshold must submit technical and financial data to support their IR&D Proposal. The advance agreement is negotiated on the basis of the TEG's evaluation of the proposal. IR&D projects, whether costs are recovered by advance agreement or formula, must meet the test of potential military relationship (PMR) to military function or operation. Responsibility for this determination has been assigned to the Technical Evaluation Group.

ASPR, in compliance with Public Law 91-441 permits appeal of decisions of the contracting officer to reduce IR&D payments. Each Military department has established an Appeal Hearing Group composed of representatives of the Assistant Secretary for I&L (Chairman), Assistant Secretary for R&D and General Counsel. Hearing Group determinations are final and conclusive at the DOD level.

2.3 Congressional Reporting

Public Law 91-441, Section 203 requires the Secretary of

Defense to submit an annual report to the Congress. The report includes:

1. A listing of those companies with which IR&D negotiations were held together with the results of negotiations.
2. Defense Contract Audit Agency statistics on IR&D and B&P payments made to major defense contractors, and
3. The manner of DOD compliance with Section 203 and any major policy changes proposed to be made by DOD in the administration of the IR&D and B&P programs.

SECTION III

CURRENT IR&D ISSUES

The controversial issues regarding DOD's policy and implementation of the IR&D program are centered around two main points:

1. Do the DOD expenditures for IR&D result in benefits to the government and, if so,
2. Is there a better way to handle IR&D programs.

Discussion will first center on the benefits of IR&D in this Section. Section IV will address alternative approaches to IR&D.

3.1 Benefits of IR&D

The Department of Defense considers its support of IR&D as necessary to maintain a strong, creative and competitive technology-based industry; an industry capable of providing new concepts and rapid responses to defense needs. The specific DOD objectives are:

1. Continued availability of technically qualified contractors who are willing and able to meet DOD needs.
2. Reduced costs through technically competitive proposals.
3. Superior military capabilities through a choice of competitive technical options originating in

IR&D programs.

Contractors view IR&D as essential if they are to remain competitive in existing business areas and to achieve a competitive position in a new technology area.

Individual contractor objectives are:

1. Ability to respond quickly to the needs of the customer.
2. Submit cost competitive bids based on correct assessment of technical risks, and
3. Provide greater technical excellence in proposals, commensurate with cost and schedule goals.

Objectives of the two principals appear to be compatible and little disagreement exists between the two parties. However, question of cost versus benefit has been addressed by Congress.

3.2 Congressional Concern

During the Senate debate on the Fiscal Year 1974 Military Procurement Bill, Senator William Proxmire introduced an amendment which, if adopted, would have reduced IR&D and B&P funds by 50 percent. The amendment was subsequently withdrawn and a request was made to the Government Accounting Office (GAO) to conduct an in-depth investigation of the underlying assumptions and the overall justification of the

IR&D program. (Ref. 13)

In their concern over IR&D, Senators Proxmire and Thomas McIntyre stated:

"The subject of IR&D has been one of continuing interest, and the sustained high level of expenditures is not consistent with the recent trend of Department of Defense purchases from the Procurement and Research, Development, Test and Evaluation appropriations. A primary objective is to establish a better balance between these elements, and to insure that due consideration is given to sound business and accounting practices but consistent with the best interests of the government."

The Senators questioned the benefit to the government and requested specific examples of IR&D contributions from industry.

The GAO completed a partial report to Senators Proxmire and McIntyre in August 1974 and finalized their effort in June 1975. During this period of time, and subsequent to the final report, numerous positions have been taken by Government and industry groups regarding the benefits of IR&D. Additionally, Senate hearings were held in September 1975 which brought out many more views on the value of the IR&D program.

3.3 GAO Conclusions

In general terms, the Government Accounting Office said that IR&D expenditures were in the nation's best interest to promote competition, advance technology, and foster economic

growth. (Ref. 7, p. ii) In an attempt to define specific IR&D projects traceable to their ultimate use, GAO found that it typically takes from 10 to 20 years for IR&D efforts to reach fruition. An investigation of near term projects over a 5-year-period revealed that they had not become specific developments. However, an examination of one company's recent high-technology proposals led GAO to conclude that company generated IR&D projects had been used in development of DOD systems, that technical alternatives had been offered, and that the company had relied on IR&D to develop products for DOD.

GAO looked into DOD's Project Hindsight to compare the effectiveness of IR&D efforts with other R&D efforts funded either in-house or by contract. Project Hindsight involved analysis of successful R&D events and their relationship to weapons systems developed before 1963. GAO's review found that IR&D expenditures, of just over 2 percent, accounted for 5.7 percent of the events leading to exploration of new technical concepts.

3.4 Tri-Association Industry Study

Industry, through its spokesman, the Tri-Association (Aerospace Industries Association of America, Electronics Industries Association and National Security Industrial Association), makes the point that IR&D explores and

demonstrates the technical capabilities which have the potential of meeting the DOD long-term functional requirements. (Ref. 11, p. 17) Great innovations, although an important part of IR&D, contribute only a part of the total value of IR&D. The valuable products of IR&D include:

1. Technology Advancement--the maintenance of a competitive capability in key technologies. All IR&D is not aimed at, nor ultimately results in, the design of products for sale to a broad spectrum of customers. It is, more often, directed towards attaining or maintaining a specific capability.
2. Systems and Other Concept Formulation Studies--a vital element in defining and refining requirements essential to new or improved defense systems.
3. Successful Failures--of value because they demonstrate at low cost that a given approach to resolution of a problem is inadequate or uneconomic.
4. Innovation of Superior Systems--the major portion of IR&D aimed at evolving systems or hardware at either significantly improved performance, lower costs, or both.

In addition to value, Tri-Association discusses the vital nature of independent or contractor-initiated research and development. Independence permits a contractor to apply his resources selectively to those technologies in which his capabilities are highest and which from his broad experience and objective perspective will benefit the government most.

3.5 Defense Science Board Analysis

The Defense Science Board (DSB) Task Force on IR&D was chartered by DDR&E to reassess the fundamentals concerning IR&D and B&P. The task force members were primarily from academic institutions and non-aerospace industries. Their results were reported in March 1975.

The DSB Task Force's first conclusion was that the major benefits from IR&D are derived principally from the "I", namely the independence of choice and execution by the contractor. (Ref. 10, p. 13) Virtually everyone the Task Force talked to, as well as the members themselves, believed that IR&D plays a role in meeting DOD needs that is at least highly important if not absolutely necessary. The Task Force recommended that Competitive Technical Effort (CTE--a new acronym to describe IR&D and B&P) be accepted as an essential component in the maintenance of a competitive industrial base responsive to DOD needs. And

since the ultimate benefits of IR&D accrue to the government, the Task Force said that the government must pay for the cost of them.

3.6 Senate Hearings

Hearings on IR&D were held before the Subcommittee on Research and Development of the Committee on Armed Forces and the Subcommittee on Priorities and Economy in Government of the Joint Economic Committee on 17, 24 and 29 September 1975. Senator McIntyre presided at the hearings; Senator Proxmire acted as cochairman. Prior to the hearings, Senator Proxmire stated his feelings that hopefully a final solution to the IR&D problem of the past 5 years would result from the hearings. The primary concern of the Senator was the lack of data equating benefits to cost.

3.6.1 Defense Research and Engineering

As Director, DDE&E, Dr. Malcolm Currie stressed the willingness of DOD to support independent research and development because "the returns to the Nation are greater than the investment it involves". (Ref. 9) He stated that in 1974, on the average, 92 percent of all IR&D projects were directly relevant to DOD interests while, on the average, DOD paid only 39 percent of the cost of the IR&D effort incurred.

Dr. Currie further indicated that the DOD has been able to maintain a competitive technology and military posture in times when defense RDT&E effort and overall investment in force modernization has been reduced, only because of the productivity of a system based on the competitive process. Dr. Currie asserts that IR&D, and the independent aspect of its management by industry is absolutely fundamental to a competitive industrial capability and an indispensable element to DOD's ability to maintain a broad national base of superior technology and military capability.

3.6.2 National Aeronautics and Space Administration

NASA's views on IR&D are quite similar to DOD's views. NASA believes that the independent character of the activity is a prime motivator of new ideas and new technology which support and drive their mission. (Ref. 12, p. 237)

NASA, like the GAO, was unable to demonstrate clearly that the measurable benefits of IR&D are worth the cost. Kenneth Woodfin, Assistant Administrator for Procurement, stated that the difficulty in identifying IR&D benefits and rewards was due to the trial and error nature of the activity, the natural time-lag between IR&D and practical application and the synergistic flow and movement of knowledge.

NASA did provide a series of 29 specific examples of IR&D projects that resulted in significant benefits to

major programs. It was carefully pointed out that these examples were not to be interpreted as the only good received from IR&D. Senator Proxmire indicated that the list of examples looked pretty imposing but was critical of the fact that specific cost dollars could not be associated with each technological example.

3.6.3 Energy Research and Development Administration

In neither size nor complexity does ERDA's involvement with IR&D begin to approach that of DOD (or even NASA). However, ERDA's policy and procedure with regard to the IR&D is similar to that of DOD.

ERDA, an R&D agency, places great emphasis on demonstration of the commercial feasibility and practicality of a variety of processes and technologies. At ERDA, the stress is placed on all available means, including IR&D, to develop energy sources and technologies.

Raymond Romatowski, Assistant Administrator for Administration, indicates that competition is essential to ERDA operations. There are energy sources competing for attention and use and there are competing concepts within each different energy source. IR&D is an important mechanism to maintain the competitive environment.

In response to a question pertaining to the adequacy of the use of more direct contracting from Mr. Hyman Fine,

Subcommittee on Research and Development Professional Staff Member, Mr. Romatowski responded, "That assumes a Government intelligence equal to that which goes into the composition and substance of all IR&D programs in the private sector. I don't think we are that smart." (Ref. 12, p. 613)

3.6.4 Western Electronics Manufacturing Association

Dr. Kenneth Oshman, on behalf of the Western Electronics Manufacturing Association (WEMA) endorsed the principles expressed by the Council of Defense and Space Industry Associations (CODSIA). They are:

1. The Congress and all Government agencies should understand and fully recognize in their actions the vital nature of IR&D in support of our national interests.
2. The right of industry to exercise management discretion on the content, and the amount of IR&D should not be abridged by arbitrary laws and regulations.
3. The Government should be motivated to encourage industry to increase IR&D effort.
4. All Government departments and agencies should employ a common policy and practice of allowability of IR&D costs (independent of the agencies' parochial interests), which recognize their true nature as essential business costs.
5. The Congress should recognize that IR&D costs are not commodities to be purchased--or not purchased--but rather are normal costs of doing business. (Ref. 12, p. 617)

The importance of Dr. Oshman's stand is that WEMA represents 730 companies--the majority of which are small

to medium sized companies. He contrasted the importance of IR&D with the value of independent R&D to a small company. He concluded in an example of a new, computer oriented company by stating the two important benefits of IR&D to the Government.

1. IR&D supported by the Government produces effective results at a fraction of the cost of DOD supported by R&D contracts.

2. There can be substantial and continuing cost and performance benefits from IR&D. Through continuing IR&D, there are dramatic improvements in the performance of products while greatly reducing the cost.

Dr. Oshman further notes that because IR&D programs profoundly affect the ability of a company to serve its customers and therefore gain new business, the programs tend to be "highly leveraged". That is, they are assigned top quality technical talent and achieve high management visibility. As such, they tend to be highly productive, which means the Government gets an unusually good bargain in the money invested in IR&D.

3.6.5 Tri-Association Ad Hoc Committee on IR&D

Mr. Thomas Murrin, testifying as Chairman and on behalf of the Tri-Association, covered specific aspects of the study alluded to in Section 3.4. Mr. Murrin's comments were confined to two general areas--the crucial dependence of our national economic health on adequate R&D expenditures and the role

that IR&D plays in the total picture.

It was pointed out that industry has contributed a growing percentage of the total national R&D--increasing from 33 percent in 1965 to 43 percent in 1974. During the same period, the Government R&D expenditures have dropped from 62 to 52 percent of the total. The industry R&D expenditures have become increasingly burdensome because of the depressed business climate in which virtually all of the aerospace industries are operating. It was further pointed out that relative to national security, DOD-directed R&D has actually been trending downward when measured in constant dollars. At the same time, the Soviets are substantially increasing their military R&D investments and now exceed the United States by 20 percent in current military R&D expenditures. (Ref. 12, p. 642)

In similar terms, there has been a significant reduction in IR&D allowances accepted by DOD in recent years--down from 51 percent in 1969 to 40 percent in 1974. Today, DOD's annual costs for IR&D are only one-twentieth of the RDT&E budget and about 1.5 percent of the total national R&D effort. Yet, over the years, IR&D has contributed invaluable advances to the nation's security and to the national technology base.

To illustrate the long-term benefits derived from IR&D, Mr. Murrin cited an example of electro-optical research which

dates back to the 1940's. The effort, initially supported solely by industry funds, was continued with support from DOD. The research effort led to the development of photo-sensitive imaging tube technology, some of which is just now entering the military inventory.

The Tri-Association also presented 48 examples of beneficial IR&D. Specific DOD end-items, in the four categories of technology advancements, components, subsystems, and major systems were traced back to contributions from IR&D.

The representatives of the Tri-Association discussed additional benefits derived from IR&D and categorized them as:

1. IR&D stimulates competition and creates technical alternatives for satisfying government requirements.
2. IR&D provides major contributions to the national technological base and helps avoid costly technical surprises in later development and production phases.
3. IR&D provides more technology per dollar in that the work is done independently by the contractor and not surrounded with the same degree of costly administrative complexities required by government contract performance.
4. IR&D permits diversification of a company's product mix to enable the company to meet its changing customers' needs.

3.6.6 Office of Management and Budget

The Office of Management and Budget (OMB) statement

indicates that one cannot, either in advance or in retrospect, establish a precise cost-benefit relationship for each dollar spent in IR&D accounts. The Hon. Hugh Witt, Administrator for Federal Procurement Policy, stated that IR&D merits must be examined on the basis of an evaluation of technological advancement, enhancement of competition and current business arrangements with industry. (Ref. 12, p. 759)

Regarding technological advancement, the Office of Federal Procurement Policy (OFPP) independently examined one area (the laser) in which great strides have been made to assess its beneficial applications. They found, without doubt, that the nucleus of most of the technological advancements was accomplished under IR&D. Mr. Witt stated that IR&D provides a high motivation for innovation and improved quality of technological output for the public good.

Competition is enhanced by permitting and encouraging industry to independently pursue alternatives to Government specified solutions. By considering alternatives, competition is broadened with a high potential for cost effective solutions using innovative technology to fulfill Government needs. To drive home his point, Mr. Witt quoted Senator Proxmire from his appearance before the Subcommittee on Federal Spending Practices, Efficiency, and Open Government

concerning major systems acquisition.

" . . . It is unwise to assume that government laboratories in all cases come up with the best designs and that these designs should be foisted upon private contractors for further development. It would be equally unwise to assume the reverse, that the private laboratories will always come up with the best designs and that the only function of the government laboratory is to test these private designs. I would hope for a more balanced implementation of the recommendations so that neither the government laboratories nor the private laboratories are unfairly restricted."

Related to current business arrangements, OMB believes the Government is getting one of its better buys through IR&D. Statistics cited were that an investment of \$457 million by the DOD with some 90 contractors has provided the Government with access to \$1.148 billion worth of technology. With recognition that 92 percent of all projects within the \$1.148 billion are relevant to military needs, the DOD is paying 43¢ on the dollar for access to contractors' IR&D efforts which have military relevancy.

DCAA data shows that the Government allowed 78 percent of actual costs through the use of advance agreements and ceilings. Considering also the allowability of B&P costs, the difference between allowable percentages and the actual expenditures equates to \$289 million which contractors cannot include in either direct or overhead charges. Thus, this difference is taken out in profit.

3.6.7 A Consultant's View

Mr. D. G. Soergel, Consultant, Public Policy Research, recalled during the hearings the acquisition policy of the 1960's known as total package procurement (TPP). A highly detailed specification was used to obtain competitive responses for undeveloped, untested systems. Responsive proposals required thousands of people in some instances and resulted in tens and even hundreds of thousands of proposal pages. IR&D and B&P expenses became a significant indirect cost element. New procurement policies since 1971 stress the use of competitive prototypes. Mr. Soergel stressed that the totality of IR&D and B&P expenditures needed to qualify and compete in a Government program reduces as competitive entry is moved toward the start of an acquisition program.

Mr. Soergel further recognized that the old TPP policy permitted contractors to carry conceptual designs further into the product development cycle using IR&D expenses. He advocates that under the new policy, independent development effort should be eliminated, and accomplished on R&D contracts. This, he claims, will eliminate 90 percent of the IR&D expenditures. Although independent development is not being achieved, independent research is the technical activity which has true benefit to the Government.

Mr. Soergel recognizes that independence is needed at least in the conceptual design phase and in the nonapplied sciences and technologies. This means that IR&D expenses will not go away, but only get smaller. R&D contracts are recommended to reduce the development portion of IR&D. (Ref. 12, p. 790)

3.6.8 An Independent View

Dr. Franklin Long and Dr. Judith Reppy of Cornell University define themselves as two scholars concerned about the effectiveness of the nation's program of military research and development. After investigating the contribution of IR&D, they conclude that Congress should look either at alternatives to the IR&D program, or at modifications. In their opinion, IR&D should be replaced by appropriately budgeted "level of effort" and exploratory R&D contracts within the RDT&E programs of DOD. (Ref. 12, p. 703)

Dr. Long and Dr. Reppy encountered real trouble in trying to ascertain the benefit of IR&D due to lack of available data on total IR&D expenditures, companies involved and amounts of recovered expenses, the character of the IR&D program, and the adequacy of the military evaluation of individually proposed IR&D programs. Many of the proposed benefits from proponents of IR&D were refuted by Drs. Long and Reppy:

1. Fostering Independence The major contractors allocate very small amounts in their government divisions for their in-house efforts. Only about 6 percent of the total military R&D done by these contractors can be thought of as truly independent. The effective network between contractors and DOD personnel provides a two-way flow of information on DOD needs and industry capability. A large proportion of contracts resulting from IR&D projects suggest that risks associated with the defense industry are not being borne by the contractor.

2. Contributing to the Technological Base A survey of major IR&D contractors indicates that a little over a third of the IR&D program can be identified as basic or applied research. These are the categories that presumably contribute to the technology base. The majority of IR&D funds are thus spent on short run development projects aimed at winning new contracts.

3. Fostering Competition As long as IR&D costs are re covered through existing contracts, the program will tend to preserve the status quo, inhibiting both exit and entry in the industry. The IR&D program discriminates against potential new suppliers in favor of established sources, and in this sense diminishes both the potential defense technology base and competition in the industry.

4. Contributions to Stability in the Defense Industry
The IR&D program is an important factor in the economic

stability of the defense industry. However, since funds for in-house R&D in nondefense firms come out of profit, IR&D payments are an implicit addition to the profits of the defense firms. Additionally, since a substantial portion of the facilities which the military contractors use have been supplied by the Government, the rate of return on invested capital is much more favorable to the defense companies.

3.6.9 Admiral Hyman Rickover

Admiral Rickover presented strong opposition to the DOD independent research and development program claiming it is ill-founded and wasteful. (Ref. 12, p. 687) As others have attempted to list examples of IR&D projects that have resulted in benefit to the DOD, Admiral Rickover presented a list of important developments obtained through direct R&D funding. He stated that the issue is not whether discoveries have been made under IR&D, but whether the Defense Department can afford to pay \$1 billion annually for contractors to spend as they see fit, in hopes that DOD will at some future unspecified date benefit from such expenditures. Admiral Rickover further criticized the expenditures for IR&D in light of other budget cuts due to a shortage of funds.

In his testimony, Admiral Rickover claims that IR&D actually inhibits competition. His contention, similar to

that of Dr. Long, is that since the largest defense contractors generally receive the largest IR&D payments, this helps them to perpetuate their dominant position in the market.

By the same token, Admiral Rickover argues that IR&D narrows the modern industrial technology base. This is due to the fact that large defense contractors receive large IR&D subsidies, smaller contractors receive smaller subsidies and firms without defense contracts receive no subsidy. Also, the Admiral claims that IR&D has no relationship to the United States lead in technology.

Specific recommendations from Admiral Rickover are:

1. The present system of DOD payments for IR&D and B&P expenses should be eliminated.
2. The DOD should allow costs of IR&D projects only when such costs are specifically provided in the contract and then only to the extent such work benefits the contract work itself.
3. The DOD should receive, in the name of the Government, patent and data rights commensurate with costs financed by the Government on independent research and development projects.

3.7 Consensus

Consensus of opinion that there is real value to IR&D is not unanimous. Those connected with the Department of Defense or closely associated with IR&D within the Government are convinced that IR&D is a necessary cost of doing business and indispensable. Industry believes that IR&D is vital;

absolutely essential to the procurement system as presently practiced. Both DOD and industry recognize the benefits that have been derived through IR&D in the past.

The GAO strongly endorses the concept of IR&D and generally supports the manner in which it is administered by DOD. The GAO was not, however, able to determine whether the benefits of IR&D are worth the cost.

There are also independent views which question the worth of IR&D based on knowledge of the cost of the program or on lack of knowledge regarding individual project costs and measures of value to DOD. Some independent views favor modification to the program; one view favors complete elimination of IR&D.

It appears that all parties have now been heard from-- it's up to Congress to decide.

SECTION IV

IR&D ALTERNATIVES

Contractors' IR&D costs are currently reimbursed through overhead--this has been the procedure since IR&D was first recognized as an allowable cost. (Ref. 4, p. 80) This practice is similar to that in commercial enterprises where R&D costs are recovered as part of the product price. The same is true for competitively priced DOD fixed price contracts.

Alternatives to the present method of reimbursement of IR&D costs have been proposed and discussed over the years. Serious consideration of alternative recovery methods was stimulated by Senators Proxmire and McIntyre in their letter to the GAO. (Ref. 13) The GAO was requested to include alternative recommendations and a response to specific questions on changes to IR&D in their in-depth investigation of the subject. Subsequently the GAO sent a listing of 14 alternatives to a number of knowledgeable persons for comments. They received responses from one industry association and 18 individuals representing Government, academia and industry. Additionally, a number of Government reports, industry papers and Senate testimonies have addressed the subject. This Section will summarize the various opinions on the major IR&D cost recovery alternatives.

4.1 Status Quo

As in any situation, the first alternative is to do nothing, that is, maintain the status quo. A recent industry study used the following national objectives to evaluate methods of handling IR&D costs. (Ref 14, p. 3)

1. The security and economic well-being of the United States which in large measure depend upon a healthy, dynamic and creative defense/space industry. Essential to these goals is the continuous advancement of U.S. technology.
2. The procurement of a multiplicity of Government needs including defense weaponry by methods and processes which foster rather than undermine the competitive free-enterprise system upon which our national economy is based.
3. The Government acquisition of its needs within the budgeted amounts for that purpose. This requires product pricing that includes all of the legitimate and necessary costs of conducting a prudent business, but at the same time reflects cost-effective design, development, and manufacture of those products at the lowest reasonable price.

Appraisal of methods of reimbursing IR&D costs were based on careful analysis of how well each supports, or fails to support these general objectives. CODSIA found that the present method, provided that the potential military relationship requirement is removed or appropriately modified, meets the objectives reasonably well. After studying the features of the present method, CODSIA made some specific recommendations for consideration by the Congress, the DOD, and all Government agencies with whom industry does business. They are as

follows:

1. The requirement for potential military relationship in Public Law 91-441 should be eliminated as unworkable.

2. The requirement for establishing ceilings on IR&D costs should be eliminated because it is in basic conflict with stated Government objectives to encourage competition and maintain a strong industrial capability.

3. Line items should not be established in any agency budgets for funding IR&D costs as though these efforts were commodities to be priced.

4. Any committee or agency considering "alternative methods" of funding IR&D should remember that IR&D are normal indirect business expenses and should be fully recognized in the pricing of Government contracts, so that full allowance of the portion of IR&D allocated to Government contracts can keep the U.S. Government on an equal footing with other customers.

Thus, industry would prefer to see the current method of IR&D recovery modified to one of less constraint. The Defense Science Board Task Force, on the other hand, concluded that the present procedure of reimbursement as an item of indirect expense be continued. (Ref. 10, p. 12)

4.2 Elimination of IR&D

As part of his testimony before the Senate subcommittees investigating IR&D, Dr. Currie responded to Senator Proxmire's question, "What is the practicality of completely eliminating Department of Defense payments to contractors for IR&D and B&P as allowable costs under Department of Defense contracts?"

Dr. Currie indicated that a disallowance of IR&D would lead to a gradual reduction in the technical competence of companies to propose and do work for the DOD. (Ref 12, p. 314) Industry might initially divert profit dollars into IR&D expenditures and seek many more technology contracts. In time, the stockholders would complain of lower earnings and direct contract technology effort would sustain the technical competence of only a limited number of contractors since there is little or no redundancy in contractual effort. The long term effect, according to Dr. Currie, would be to force many current contractors out of the defense business. The net effect would be a great increase in the number of sole source procurement actions in early phases of system acquisition plus a very limited and essentially captive defense industry.

The GAO responded to the identical question from Senator Proxmire. They solicited comment from DOD which again said that if IR&D were replaced dollar for dollar by direct contract R&D, the added cost of contract administration would reduce the R&D effort. DOD believes that much of the capability of scientists in industry, educational institutions, and other non-Government organizations would be lost to DOD if they were not permitted the freedom to pursue concepts they have evolved. (Ref. 7, p. 48)

NASA took a similar position to that of Dr. Currie. If IR&D costs were disallowed, contractors would attempt to finance the cost of this work through profits. Since profits are uncertain, the resources available for IR&D would lack stability and continuity, and without this, R&D would be inefficient because personnel and facilities cannot be programmed beyond the short term.

Industry response emphasized that DOD does not pay for IR&D. It buys products and services which are priced to include allowable costs, and only part of the IR&D costs become eligible for consideration in defense contract pricing. Industry contends that the general level of defense contract profits is already low and that many fixed-price contracts are loss contracts.

The Tri-Association emphasizes that there is no alternative to the performance of IR&D and B&P--these efforts are a matter of survival to industry. The work must be done and the costs must be incurred just like any other normal cost of doing business. (Ref. 11, p. 27)

Some form of IR&D reimbursement is required by industry to maintain a basis for competitive negotiations (nearly 70% of all current procurements) of major weapons systems.

4.3 Direct Funding of IR&D

Three questions posed by Senator Proxmire to DOD and GAO related to the practicability of eliminating or reducing IR&D

reimbursement as allowable costs while providing some measure of direct funding.

Dr. Currie stated that contract implementation of IR&D could only be used as a substitute for overhead recovery if the objective of IR&D were similar to directed R&D. He maintains that this is not the case. The objective of RDT&E is to equip forces with the latest and finest material possible. IR&D has the objective of maintaining a competent and competitive base of contractors ready and able to provide material on a competitive basis. Unless laws are amended to eliminate the stipulation that competition is the primary basis for procurement, contract implementation as a cost recovery alternative to IR&D cannot be used. (Ref. 12, p. 314)

DOD submitted a response to GAO on the subject of direct funding and pointed out that DOD deals with approximately 20,000 contractors, all of which incur B&P expense and many of which incur IR&D. Direct funding to so many contractors would increase the negotiation, technical review and administrative workload far beyond DOD's current IR&D and B&P management capability. Also, direct IR&D support would reduce or eliminate the independence factor which was considered to be one of the prime IR&D benefits by DOD and other IR&D advocates. (Ref. 7, p. 50)

NASA does not favor direct funding by contract or grant because of the potential loss of independence and flexibility

inherent under the present system. They, as did DOD, recognize that administration would be inefficient and uneconomical. There would be great difficulty in allocating funds among the contractors in an acceptable manner

Industry reviewed several different direct funding alternatives, and rejected each. (Ref. 14) A major overriding concern was that any direct method of recovery would undermine industry's independence and gradually decrease the Government's procurement options. In exchange for a small contracted task, a company would stand to lose its competitive edge over others. Any proprietary position which might have resulted from new technology would immediately be forfeited.

Another disadvantage common to all direct contract efforts is that the total cost to the Government may increase as pointed out by the GAO. The Government would have to pay the full cost for any non IR&D effort plus additional administrative costs due to the costs involved in awarding a contract.

Other concerns and disadvantages of each specific direct funding method proposed are given in the following paragraphs.

4.3.1 Contract for a Portion of the Contractor's IR&D Program

Under this proposed alternative a ceiling would be determined through advance negotiation. Technical evaluators

would then select projects from contractor's plans which are believed to be worthy of direct R&D funding. A reduction would be made from the IR&D ceiling and accepted projects would compete for funding with other R&D programs.

GAO said that work by this agreement would be delayed pending negotiation and award of contract. CODSIA further pointed out that the necessity to compete for R&D funds would mean some of the programs would not be funded. Further, in a situation involving several high risk approaches to solving an important problem, would the Government selection method produce the right ones? As Dr. Foster, former DDK&E Director stated:

"We in DOD are not, and must not be so complacent as to assume that we alone within the limited Defense Research and Development community, have the wisdom and ability to judge all these technical projects and approaches that may produce beneficial results."

4.3.2 Direct Contract for Categories of Work

Since IR&D projects fall within basically two categories, namely independent research and independent development, the manner in which they are funded by the Government would depend upon the category in which they fall. All costs of IR&D projects which concern "research" would be recovered by the contractor through allocation to contracts as overhead costs.

For development efforts, the contractor would submit a listing of proposed development projects together with the estimated cost of each project. After evaluation, the agency would select those projects it wishes to direct contract for. The contractor would have to bear the cost of pursuing any development project for which it was not awarded a contract.

GAO and CODSIA generally agree that it would be difficult to distinguish between research and development in all cases. Probably 25% of all IR&D would be in the grey area. In many instances work may be clearly developmental, but not directed at marketable end items. Thus development effort aimed at cost reduction or improved component parts with wide application would be subject to compete for R&D funds whereas it seems that the purpose of this alternative is to exclude only development of end items from IR&D.

4.3.3 Level of Effort Contracts

This alternative for consideration involves negotiating direct annual contracts providing for a maximum level of effort by the contractor in designated areas of R&D. Under this concept, the contractor would not be required to obtain advance authorization of its plans by the Government representative, but instead would have full freedom to conduct R&D effort at its own discretion within a very broad scope (e.g., aircraft) of the contract. It would be required to report

to the Government at the end of the contract year as to the results of its efforts.

Many of the problems addressed by both GAO and CODSIA relate to additional administrative requirements and therefore costs and delays. For instance, each agency would have to fund and negotiate contracts with the contractor. Every agency would have to budget at least 18 months ahead. Any contractor changes to his program would likely require several contracting officer approvals. Congress would have to review this item as part of each agency's annual budget request and make demands for justification.

Additionally, although a level of effort contract might start with a broad statement of work, successive negotiations and application of agency relevancy tests would lead to more Government direction of work to be performed. The advantages of independence is then lost and project decisions would then no longer be directed by company management and scientific personnel.

4.3.4 Research Grant Programs

An IR&D grant program could be established to replace the present recovery process. Contractors would be encouraged to pursue IR&D on their own. If an area of research or development appears fruitful to the contractor, he would submit a proposal for grant monies. Requests for grants could be

generally stated and could be for work involving several years of effort.

Again the costs related to a system requiring additional proposals, evaluations, negotiations, and preparation and processing of grant instruments will be substantial. But a bigger point made by the GAO is that contractors may be reluctant to use their own funds for research if they are not assured of getting grant funds for further work. This would have the same effect as eliminating or reducing the level of present method IR&D.

4.3.5 Priority Basis IR&D Funding

Under this alternative, an interagency committee would annually prepare a technical objective document which would classify and describe the research and development programs in which DOD would have an interest in the next 5 years.

Each classification and/or program would be assigned a value, stated as a percent, to reflect the importance of the program as the committee views it, and the amount of which the Government would pay.

A contractor would know what percent of his IR&D costs would be recovered based on the value assigned to the activity or discipline investigated.

The major problems with this suggested method of funding IR&D as specified by GAO are:

1. Possible loss of technical base for areas of research not classified by Government as essential.

2. Industry may be influenced by the Government as to which areas should have IR&D.

Any system wherein the Government determines which projects it will reimburse and to what extent would result in the total elimination of independence by the contractor.

CODSIA maintains that priority funding would essentially accomplish three things, none of which are in the best interest of the Government:

1. Contractors would tend to flock to those programs bearing a high percentage of reimbursement.

2. Companies unqualified in certain areas would nevertheless work in these areas to maximize reimbursement.

3. Areas with low percentages or totally missing from the list would receive less attention than they deserve.

4.4 IR&D Recovery Through Profit Negotiations

An approach suggested is to eliminate the allowance of IR&D costs as an acceptable contract cost and instead, to include it as an element of the contractor's profit. The profit factor could be incorporated into the weighted guidelines as used by DOD in negotiating contract prices. This method would recognize that the amount of IR&D incurred by a contractor is influenced by the contractor's long-term objectives and is subject to adjustment.

Favorable comments to this approach include the fact that advance agreements would be eliminated. Contractors would have an incentive to eliminate unproductive engineering efforts. GAO also points out that allowing IR&D as a profit element would not deprive the Government of assurance that the contractor actually would continue to perform IR&D. Contractors must continue effort over a long period to keep up with competition or fail.

Industry bases their concern on the fact that profit is defined as the excess of the selling price of goods over their costs. There is no basis for differentiating between G&A type costs and other direct or indirect costs. There is no legitimate or equitable rationale for proposing that IR&D costs be reimbursed through profit. CORDSIA points out the fact that both Government and industry agree in the conclusion that profits earned from performing Government contracts are significantly lower than commercial profits. Supporters of this IR&D alternative believe that levels of profit would increase, with appropriate increases in the statutory limits, to reflect the IR&D expense. Realistically, however, it may be difficult for the hundreds of contractors dealing with one company to provide a uniform policy and appropriate increase on every contract negotiated.

Further concern centers around subcontracts. A number of contractors with large IR&D programs recover a major part of

the cost under Government subcontracts. Even if the Government were to establish an equitable and consistent recovery through profit program, there would still be no assurance that prime contractors or higher tier subcontractors also would do so.

Regarding the technical aspects, a profit recovery method would lead to a loss of technical visibility and interchange. The Government would be less aware of what is being done, by whom and how it relates to in-house and contracted R&D.

4.5 Recovery for Benefit to Contract

This alternative allows for recovery of IR&D costs through overhead but establishes limitations by negotiating cost allowance on an individual contract basis.

IR&D would be allowable only to the extent specifically set forth in the contract, and then only to the extent the costs provide a direct or indirect benefit to the contract work.

The advantage of this, the AEC method of IR&D recovery, is that it reduces the Government's funding of contractors' projects. It recognizes only the Government's interests and abolishes the practice of subsidizing contractor IR&D.

CODS1A agreed and amplified the disadvantages stated by the GAO. Most had to do with the difficulties anticipated due to a lack of uniform standards. The allowance of IR&D

costs would vary on every contract written because contract-related projects would be different for each contract. A technical appraisal of every IR&D project would be necessitated in order to identify any that may provide benefit to the work of each contract. The administrative mechanism to achieve this would be extremely costly,

Another point made by GAO was that contractors would have difficulty maintaining continuity of their IR&D programs under this alternative. They would have no advance knowledge of which projects would be supported until after each contract negotiation. Advance planning of IR&D programs would not be possible.

4.6 Recovery Based on Formula-Type Approaches

There are several proposed alternatives which would simplify the administration of IR&D and thereby reduce administrative costs and provide uniform procedures for all contractors. The principal alternatives in this group are:

1. A formula based on the contractor's prior years experience. Currently the DOD uses a formula as an option for contractors not meeting the requirement for negotiating advance agreements. The formula would be applicable to all contractors based on IR&D costs incurred over preceding years with a percentage ceiling established.

2. Recovery through a Contractor Weighted Average Share in the Cost Risk (CWAS) formula. The CWAS formula evaluates and assigns weighted ratings to sales commitments of individual contractors. Each contractor develops cost-incurred data on its Government business, broken down by types of contracts and on its commercial business. CWAS is currently available to all DOD contractors on a voluntary basis.

The Tri-Association sees the merits of formula approaches in that they recognize the inherent economic constraints present in today's competitive market to the extent that a company qualifies. They add, however, that the requirement for establishing ceilings on IR&D should be eliminated because it is in basic conflict with stated Government objectives to encourage competition and maintain a strong industrial capability. (Ref. 11)

The major disadvantages from GAO seem to be the lack of assurance that IR&D is relevant to the agency's mission since technical and relevancy tests would be eliminated. The formula approach would not provide for inclusion of factors which consider technical quality or effective management of IR&D programs.

CODSIA, in general agreement with GAO adds that the viability of a formula approach is highly variable depending upon several factors, such as the mathematics of the formula finally selected, the extent of flexibility allowed in its

implementation and the nature of independent R&D work being performed in the individual company.

4.7 No Constraints on Recovery--Except Reasonableness and Allocability

This method contemplates the removal of all controls and limitations on the recovery by industry of its normal costs of conducting IR&D efforts. Cost would be defined in ASPR and would be allowable as overhead to the extent that they are determined to be reasonable and allocable.

Since this alternative retains the controls of reasonableness and allocability, in reality only the relevancy and technical quality controls would be removed. The reasonableness control with its negotiation and advance agreements would be retained, so costs of IR&D should not increase. Retention of the IR&D data bank should minimize the reduction in visibility to the Government of contractor programs.

The GAO lists the major advantages as reducing administrative costs and providing contractors with maximum flexibility in conducting their IR&D programs. One respondent to GAO claims that this method is most likely to foster the kinds and amounts of IR&D necessary to achieve national economic and social objectives while insuring the work is efficiently managed and performed.

As can be anticipated, industry is highly in favor of this alternative which essentially represents DOD's position

and procedure during the 1960s until the enactment of Section 203 of Public Law 91-441. The Tri-Association contends that full reimbursement puts the Government on an equal footing with all other company customers. Anything less represents a subsidization of the U.S. Government by American industry. CODSIA concludes:

"Now more than ever, economic and social needs, as well as our national security, demand the elimination of any governmental practices which inhibit the performing of IR&D necessary to secure our freedom, curtail inflation, improve the state of the economy, overcome environmental problems, and cure social ills. This method is the most likely to foster the kinds and amounts of IR&D necessary to achieve those objectives while, at the same time, assuring that the work is managed and performed in an efficient manner."

Those in disfavor with a recovery method without constraints anticipate greatly increasing IR&D costs. They claim there would be a step increase because DOD contracts would get a full allocation of contractors' expenditures which are greater than ceilings presently being negotiated. Secondly, the competitive advantage to be gained by contractors through increased technology would drive IR&D costs higher than they are today.

Others indicate that after-the-fact evaluation of reasonableness essentially abandons any idea of effective control, direction or screening. Congress would never accept this.

4.8 Present Method Versus Alternatives

The IR&D alternatives proposed by the GAO were reviewed by a number of experts in Government, industry and academia. Respondents did not agree on any alternative or combination of alternatives as representing a considerable improvement over the present method. In all cases, respondents found it necessary to develop a set of criteria for evaluation of the objectives or goals of the IR&D proposals. Obviously the individual criteria established highlighted the interests of each separate reviewer. The majority of GAO respondents explicitly stated that the present DOD method was preferable to any of the proposed alternatives. Of the minority opinions, one preferred a formula approach, two advocated direct contracting variations, and one the recovery method based on benefit to a specific contract. Industry clearly prefers a reduction in constraints, finding the present method without PMR a viable situation. Tri-Association believes that inherent economic constraints in competition are sufficient to control IR&D costs.

The GAO did not make a specific recommendation but did suggest that the issue may only be resolved by a statement of Congressional policy on the Government's support or nonsupport of IR&D. That's where the issue stands.

SECTION V

SUMMARY

In the recent Senate hearings on independent research and development, each and every testimony included a discussion of the benefits or lack of benefits of IR&D. Additional comment has appeared in position papers from both Government and industry. Opinion on the value of IR&D varies widely. Those closest to the effort, DOD, NASA, ERDA and industry, support it fully and insist that the benefits are real and cost effective. Those in a position of review, including the GAO, OMB and DSB Task Force endorse the program after careful investigation. Independent views, and that of Admiral Rickover, question parts or all of the current IR&D program. A personal conclusion from the comments and testimony is that there are real benefits from IR&D. The true value takes years to achieve, and is highly dependent on a flow of information from the Government. As long as the military departments and other Government agencies continue to convey their present deficiencies and long-term objectives to industry through planning sessions and technology seminars, the independent aspect of research and development within industry will result in the application of contractor specialties to the problems.

Benefit is not the only controversial area. Major Howard Bethel's report, "An Overview of DOD Policy for and Administration of IR&D" covers the primary issues surrounding technical evaluations, relevancy, patent and data rights, and others. In consideration of all of these problem area, several alternatives to the present IR&D recovery method have been proposed. These have been reviewed by industry and Government representatives. There does not appear to be sufficient rational to deviate much from the present system. It provides a reasonable balance in equity to both the Government and industry.

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INTERVIEWS:

1. Major Howard Bethel, Air Force, Congressional Activities Office, Pentagon
2. Lieutenant Colonel Richard Hartke, Air Force, SAFRD, IR&D Executive Secretary, Pentagon